REMARKS

The present application was filed on February 10, 2004 with claims 1 through 22. Claims 1 through 22 are presently pending in the above-identified patent application. Claims 16, 17, 21 and 22 are proposed to be amended.

In the Office Action, the Examiner rejected claims 16, 17, 21 and 22 under 35 U.S.C. §112 as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner rejected claims 1-4 and 13-16 under 35 U.S.C. §103(a) as being unpatentable over Madsen et al. ("Optical filter architecture for approximating any 2x2 unitary matrix," Optics Letters, vol. 28, no. 17, April 1, 2003, pages 534-536) and in view of MacFarlane et al. (United States Patent Application No. 6,687,461 B1). The Examiner rejected claims 5 and 7 under 35 U.S.C. §103(a) as being unpatentable over Madsen et al., in view of MacFarlane et al. and further in view of Applicant's Admitted Prior Art. The Examiner rejected claims 7-10 and 18-21 under 35 U.S.C. §103(a) as being unpatentable over Madsen et al. and in view of Eyal et al. ("Design of Broad-Band PMD Compensation Filters," IEEE Photonics Technology Letters, vol. 14, no. 8, August 2002, pages 1088-1090). The Examiner further rejected claims 11 and 22 under 35 U.S.C. §103(a) as being unpatentable over Madsen et al., in view of Eyal et al. and further in view of Applicant's Admitted Prior Art. The Examiner objected to claims 6 and 12 as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Section 112 Rejections

Claims 16, 17, 21 and 22 were rejected under 35 U.S.C. §112 as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In particular, the Examiner noted that claims 16, 17, 21 and 22 recite the step of measuring polarization mode dispersion but the claims from which claims 16, 17, 21 and 22 depend are apparatus claims. Claims 16, 17, 21 and 22 have been amended in accordance with the Examiner's suggestion. Applicant' respectfully requests that the section 112 rejections be withdrawn.

Independent Claims 1, 7, 13 and 18

Claims 1 and 13

Independent claims 1 and 13 were rejected under 35 U.S.C. §103(a) as being unpatentable over Madsen in view of MacFarlane et al. With regards to claim 1, for example, the Examiner asserts that Madsen discloses a method for compensating for polarization mode dispersion in an optical fiber communication system (citing Figures 1-3), comprising the steps of: reducing said polarization mode dispersion using a cascade of all-pass filters (citing Abstract and Fig. 3); and adjusting coefficients of said all-pass filters (citing page 535, left column, first complete par.).

The Examiner acknowledges that Madsen adjusts the coefficients using a least square algorithm (citing page 535, left column, first complete par.), but do **not** disclose adjusting the coefficients using a *least mean square algorithm*. The Examiner asserts, however, that MacFarlane et al. teach a system related to Madsen including optical filters for compensating for polarization mode dispersion having adjusted coefficients (col. 1, lines 28-53, col. 2, lines 51-65 and col. 5, lines 23-42). The Examiner further asserts that MacFarlane et al. teach that the filter coefficients can be adjusted using a variety of minimization algorithms including a least squares algorithm or an LMS algorithm (col. 19, lines 16-22).

Contrary to the Examiner's assertion, while MacFarlane et al. may address optical filtering and polarization, there is no disclosure or suggestion to *compensate for polarization mode dispersion*. The term "polarization mode dispersion" does not even seem to appear in MacFarlane et al.

Thus, MacFarlane et al. does not disclose or suggest the step of "reducing said polarization mode dispersion." In addition, MacFarlane et al. does not disclose or suggest that the polarization mode dispersion is reduced "using a cascade of all-pass filters," and the Examiner has not alleged that MacFarlane et al. discusses all-pass filters.

In addition, again contrary to the Examiner's assertion, MacFarlane et al. does **not** teach that the filter coefficients can be adjusted using a variety of minimization algorithms including an LMS algorithm (citing col. 19, lines 16-22). While the LMS algorithm is discussed at col. 19, lines 16-22, it is **not** in connection with the adjustment of filter coefficients. Rather, the discussion at col. 19, lines 16-22 is directed to adjusting

"the gains on an on-going basis to minimize error correction coding related error rates" (lines 11-13). It is further noted that as "the gains are adjusted, the control signal values in the look-up tables are also preferably updated as well." Id. at lines 14-16. Applicant can find no disclosure or suggestion in MacFarlane et al. to adjust the coefficients of a filter (especially an all-pass filter) using the LMS algorithm (and especially in the context of reducing polarization mode dispersion).

Applicant has previously acknowledged that the use of the LMS algorithm for adapting FIR filters is both well-known and straightforward. Applicant strongly asserts, however, that it would not have been obvious to a person of ordinary skill in the art to apply the LMS algorithm to the adaptation of all-pass filters. It is not known to adapt all-pass filters using the LMS algorithm. Furthermore, the adaptation equations for FIR filters do not apply to the adaptation of an all-pass filter.

An Examiner must establish "an apparent reason to combine ... known elements." *KSR International Co. v. Teleflex Inc. (KSR)*, 550 U.S. ___, 82 USPQ2d 1385 (2007). Here, the Examiner merely states that it would have been obvious to implement the LMS adaptation of MacFarlane et al. in the system of Madsen as an "engineering design choice" of another way to provide the minimization function. As discussed hereinafter, the use of the LMS algorithm in the manner suggested only by the present invention is more than a mere design choice.

Applicant is claiming a new technique for compensating for polarization mode dispersion in an optical fiber communication system *by* using a cascade of all-pass filters; and adjusting coefficients of said all-pass filters *using a least mean square algorithm*.

There is no suggestion in Madsen or in MacFarlane et al., alone or in combination, to adjust coefficients of a cascade of all-pass filters *using a least mean square algorithm*.

In further support of Applicant's position that it would not have been obvious to a person of ordinary skill in the art to apply the LMS algorithm to the adaptation of all-pass filters, Applicant notes that for most applications, an all-pass filter is not advantageous and an FIR filter is much easier to implement. Thus, persons of ordinary skill in the art are inclined to use FIR filters and due to the complexity of an

implementation with an all-pass filter, would not be motivated to substitute an all-pass filter for an FIR filter, in the manner suggested by the Examiner. In addition, since the adaptation equations for FIR filters do not apply to the adaptation of an all-pass filter, the combination suggested by the Examiner would not work.

This information known to those of ordinary skill in the art ***teaches away*** from the present invention. The *KSR* Court discussed in some detail United States v. Adams, 383 U.S. 39 (1966), stating in part that in that case, "[t]he Court relied upon the corollary principle that when the prior art teaches away from combining certain known elements, discovery of a successful means of combining them is more likely to be nonobvious." (KSR Opinion at p. 12). Thus, there is no reason to make the asserted combination/modification.

Claims 7 and 18

Independent claims 7 and 18 were rejected under 35 U.S.C. §103(a) as being unpatentable over Madsen in view of Eyal et al. With regards to claims 7 and 18, the Examiner again asserts that Madsen discloses a method for compensating for polarization mode dispersion in an optical fiber communication system (citing Figures 1-3), comprising the steps of: reducing said polarization mode dispersion using a cascade of all-pass filters (citing Abstract and Fig. 3); and adjusting coefficients of said all-pass filters. (citing 3rd full par. of col. 1 on page 879).

The Examiner acknowledges that Madsen adjusts the coefficients using a least square algorithm. (citing page 535, left column, first complete par.), but do **not** disclose adjusting the coefficients using a *Newton algorithm*. The Examiner asserts, however, that various optimization algorithms are known and that Eyal et al. teach in a system including optical filters for compensating for polarization mode dispersion having adjusted coefficients (page 1088) Eyal et al. further teach that the filter coefficients are adjusted using a Newton algorithm (citing page 1089, end of first par. of right column).

Eyal et al. does not disclose or suggest that the polarization mode dispersion is reduced "using a cascade of all-pass filters," and the Examiner has not alleged that Eyal et al. discusses all-pass filters.

In addition, contrary to the Examiner's assertion, Eyal et al. does **not** teach that filter coefficients are adjusted using a Newtown algorithm in the discussion on page

1089, end of first par. of right column While the Newton algorithm is discussed in this passage, it is **not** in connection with the adjustment of filter coefficients. Rather, the discussion at page 1089, end of first par. of right column, is directed to correction of *optimization variables*. The *optimization variables* are clearly distinct from the coefficients in the preceding discussion in the same paragraph.

Applicant has already acknowledged that the use of the Newton algorithm for adapting FIR filters is both well-known and straightforward. Applicant strongly asserts, however, that it would not have been obvious to a person of ordinary skill in the art to apply the Newton algorithm to the adaptation of all-pass filters. It is not known to adapt all-pass filters using the Newton algorithm. Furthermore, the adaptation equations for FIR filters do not apply to the adaptation of an all-pass filter.

An Examiner must establish "an apparent reason to combine ... known elements." *KSR International Co. v Teleflex Inc. (KSR)*, 550 U S. ___, 82 USPQ2d 1385 (2007) Here, the Examiner merely states that it would have been obvious to implement the Newtown adaptation of Eyal et al in the system of Madsen as an "engineering design choice" of another way to provide the minimization function As discussed hereinafter, the use of the Newton algorithm in the manner suggested only by the present invention is more than a mere design choice.

Applicant is claiming a new technique for compensating for polarization mode dispersion in an optical fiber communication system *by* using a cascade of all-pass filters; and adjusting coefficients of said all-pass filters *using a Newtn algorithm*.

There is no suggestion in Madsen or in Eyal et al., alone or in combination, to adjust coefficients of a cascade of all-pass filters *using a Newton algorithm*.

In further support of Applicant's position that it would not have been obvious to a person of ordinary skill in the art to apply the Newton algorithm to the adaptation of all-pass filters, Applicant notes that for most applications, an all-pass filter is not advantageous and an FIR filter is much easier to implement. Thus, persons of ordinary skill in the art are inclined to use FIR filters and due to the complexity of an implementation with an all-pass filter, would not be motivated to substitute an all-pass filter for an FIR filter, in the manner suggested by the Examiner. In addition, since the

adaptation equations for FIR filters do not apply to the adaptation of an all-pass filter, the combination suggested by the Examiner would not work.

This information known to those of ordinary skill in the art ***teaches away*** from the present invention. The *KSR* Court discussed in some detail United States v. Adams, 383 U.S. 39 (1966), stating in part that in that case, "[t]he Court relied upon the corollary principle that when the prior art teaches away from combining certain known elements, discovery of a successful means of combining them is more likely to be nonobvious." (KSR Opinion at p. 12) Thus, there is no reason to make the asserted combination/modification.

Applicant respectfully requests the withdrawal of the rejection of independent claims 1, 7, 13 and 18.

Dependent Claims

Claims 2-6, 8-12, 14-17 and 19-22 are dependent on independent claims 1, 7, 13 and 18, and are therefore patentably distinguished over Madsen, MacFarlane et al., Eyal et al. and Wang et al., alone or in any combination, because of their dependency from independent claims 1, 7, 13 and 18 for the reasons set forth above, as well as other elements these claims add in combination to their base claim.

All of the pending claims following entry of the amendments, i.e., claims 1-22, are in condition for allowance and such favorable action is earnestly solicited.

If any outstanding issues remain, or if the Examiner has any further suggestions for expediting allowance of this application, the Examiner is invited to contact the undersigned at the telephone number indicated below.

The Examiner's attention to this matter is appreciated.

Respectfully submitted,

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